

## CHAPTER 8

### ASSEMBLY OF THE ROCKET MOTOR ASSEMBLY

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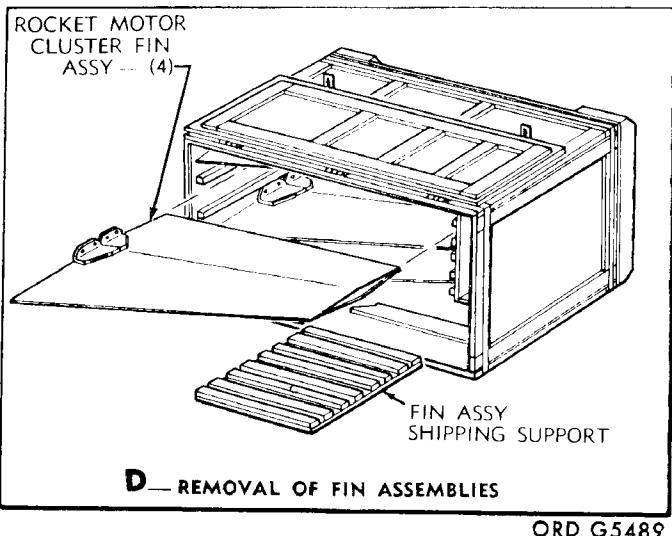
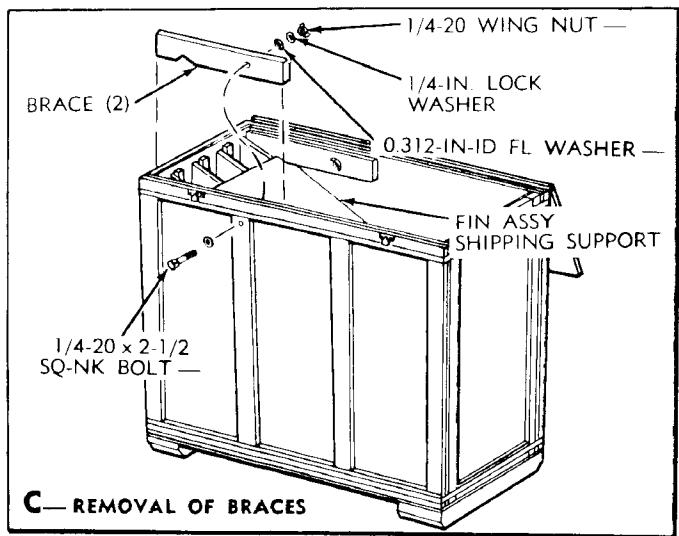
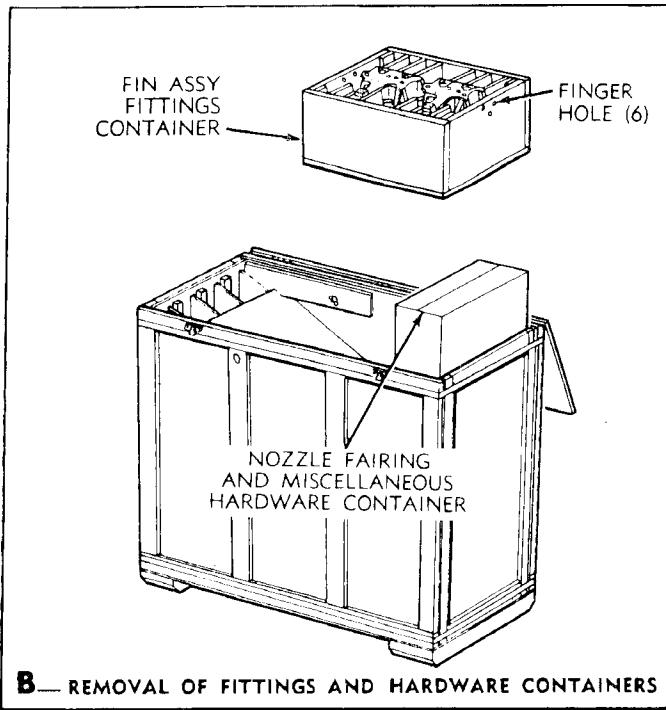
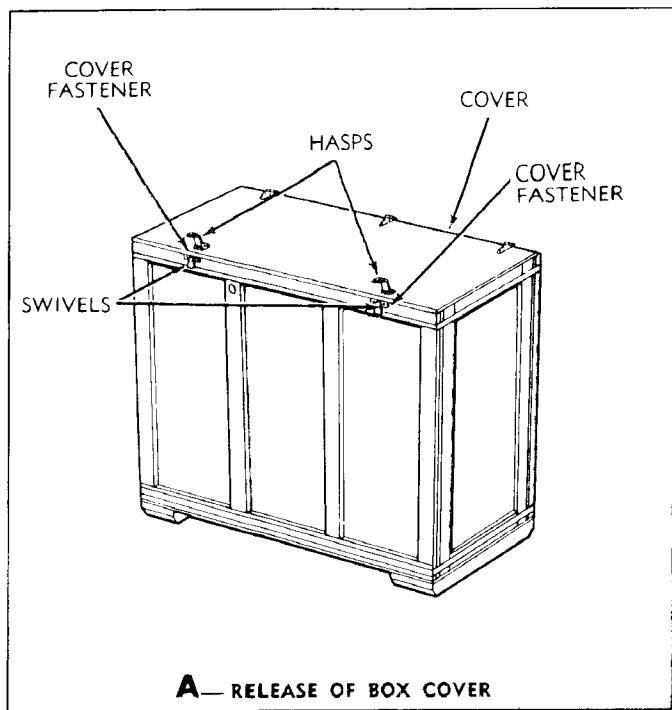
#### **8-1. General**

The rocket motor cluster is shipped in an individual shipping and storage box (less fins) as an assembled unit, or in six separate shipping and storage boxes as a disassembled unit. The uncrating procedures are outlined below for both the assembled and the disassembled units. Rocket motor fins shipping and storage box M32 is shipped with disassembled units. Rocket motor fins shipping and storage box M39 is shipped with assembled units.

#### **8-2. Uncrating Rocket Motor Fins Shipping and Storage Box M32**

- a. Perform the inspection of rocket motor fins shipping and storage box M32 (par. 3-4).
- b. Break the lead seals located on the two cover fasteners.
- c. Cut the shipping straps that secure the cover to the box.
- d. Turn the swivels (A, fig. 8-1) on the two cover fasteners.
- e. Release the hasp from each of the two cover fasteners, and raise the cover.
- f. Use the finger holes (B) at each end of the fin assembly fittings container, and lift the container from the box.
- g. Remove the nozzle fairing and miscellaneous hardware container from the box.
- h. Remove the wing nut (C) lock-washer, flat washer, and squareneck bolt from each of the two braces that secure the fin assemblies shipping support in the box.
- i. Place the shipping and storage box (D) on its side, with the cover on top to facilitate the removal of the rocket motor cluster fin assemblies.

- j. Remove the fin assemblies shipping support.
- k. Carefully remove the rocket motor cluster fin assemblies.
- l. Remove all corrosion-preventive compound from the unpainted surfaces of the fin assemblies.
- m. Inspect each fin assembly for external damage.
- n. Place two fin assemblies (fig. 8-2) in the right side of the fin storage rack on the rocket motor cluster truck by performing the operations listed in steps (1) through (3) below.
- (1) Loosen the hand nut that secures the channel to the fin storage rack on the truck, and lower the channel.
- (2) Place the fin assemblies in the fin storage rack.
- (3) Raise the channel, and secure it to the truck with the hand nut.
- o. Repeat n above to place the two remaining fin assemblies in the left side of the fin storage rack on the rocket motor cluster truck.
- p. Check the components shipped in the fin assembly fittings container (B, fig. 8-1) and the nozzle fairing and miscellaneous hardware container against their respective packing lists and place in a suitable area.
- q. Report any damaged or missing parts to the supervisor.
- r. Remove all corrosion-preventive compound from the unpainted or interior surfaces of the components.
- s. Close the cover (A), and secure it with the hasps and swivels.
- t. Return the shipping and storage box to the storage area.



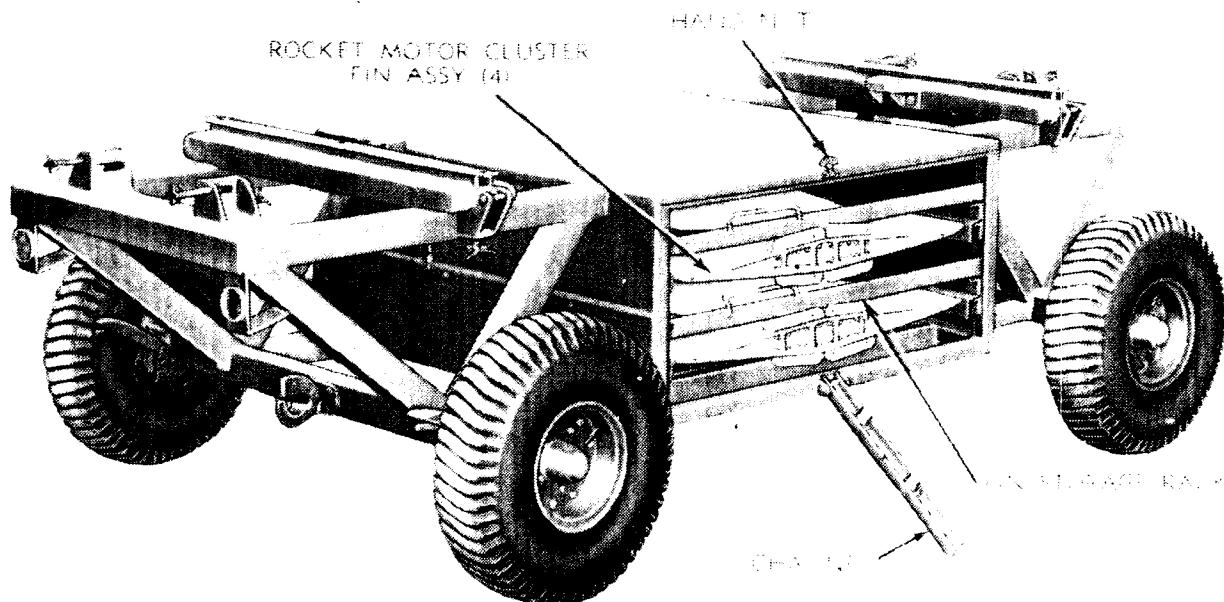
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*Figure 8-1. Uncrating rocket motor cluster fins shipping and storage box M32.*

### 8-3. Uncrating Rocket Motor Fins Shipping and Storage Box XM39

- a. Perform inspection of rocket motor fins shipping and storage box M39 (par. 3-4).
- b. Break the lead seals on the two cover fasteners.
- c. Cut the shipping straps that secure the cover to the box.
- d. Turn the swivels (A, fig. 8-3) on each of the two cover fasteners.

- e. Release the hasp from each of the two fasteners, and raise the cover.
- f. Remove the hardware carton (B).
- g. Remove the wing nut (C), lock-washer, flat washer, and square-neck bolt that secure each of the two braces to the box.
- h. Place the shipping and storage box (D, fig. 8-3) on its side, and remove the fin assemblies shipping support.



*Figure 8-2. Storage of the rocket motor cluster fin assemblies on the rocket motor cluster truck.*

- i. Carefully remove the four rocket motor cluster fin assemblies.
- j. Remove all corrosion-preventive compound from unpainted surfaces of the fin assemblies.
- k. Inspect each fin assembly for external damage.
- l. Place two fin assemblies (fig. 8-2) in the right side of the fin storage rack on the rocket motor cluster truck by performing the operations listed in steps (1) through (3) below.
  - (1) Loosen the hand nut that secures the channel to the fin storage rack on the rocket motor cluster truck, and lower the channel.
  - (2) Place the fin assemblies in the fin storage rack.
  - (3) Raise the channel, and secure it to the rocket motor cluster truck with the hand nut.
- m. Repeat l above to place the two remaining fin assemblies in the left side of the fin storage rack on the rocket motor cluster truck.
- n. Check the components shipped in the hardware carton (B, fig. 8-3) against the

enclosed packing list, and place in a suitable area.

- o. Report any damaged or missing parts to the supervisor.
- p. Remove all corrosion-preventive compound from the unpainted surfaces of the components.
- q. Close the cover (A), and secure with the hasps and swivels.
- r. Return the rocket motor cluster fins shipping and storage box to the storage area.

#### 8-4. Uncrating Rocket Motor Components Shipping and Storage Box XM36

- a. Perform inspection of rocket motor components shipping and storage box XM-36 (par. 3-4).
- b. Break the lead seal (A, fig. 8-4) on the cover fastener.
- c. Cut the shipping straps that secure the cover to the box.
- d. Turn the swivel on the box.
- e. Release the hasp, and raise the cover.
- f. Remove the upper blocking assembly (B) from the box.

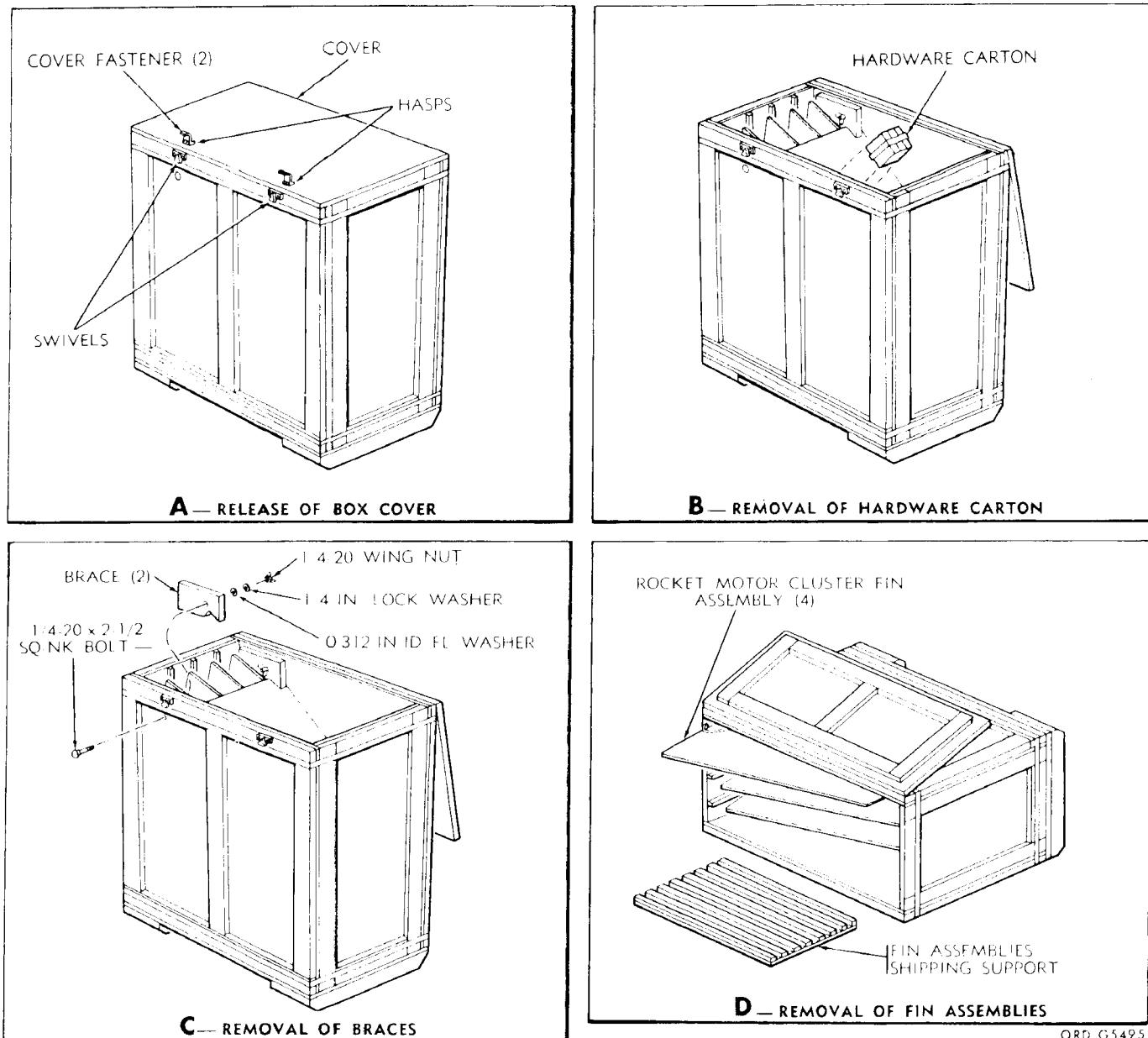


Figure 8-3. Uncrating the rocket motor cluster fins shipping and storage box XM39.

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g. Remove the wing nuts, flat washers, and square-neck bolts that secure each of the four wooden supports to the inside corners of the box.

h. Remove the intermediate container from the center of the rocket motor thrust ring assembly (B).

i. Remove the lower blocking assembly from the bottom of the box (C).

j. Remove the thrust ring assembly.

k. Remove the shipping straps that secure the rocket motor igniter cable to the thrust ring assembly, and remove the cable.

l. Inspect the thrust ring assembly for visible damage.

m. Inspect the four elevon locks and lanyard mounting bracket.

n. Check the components shipped in the intermediate container against the enclosed packing list, and place in a suitable area.

o. Report any damaged or missing parts to the supervisor.

p. Return the box to the storage area.

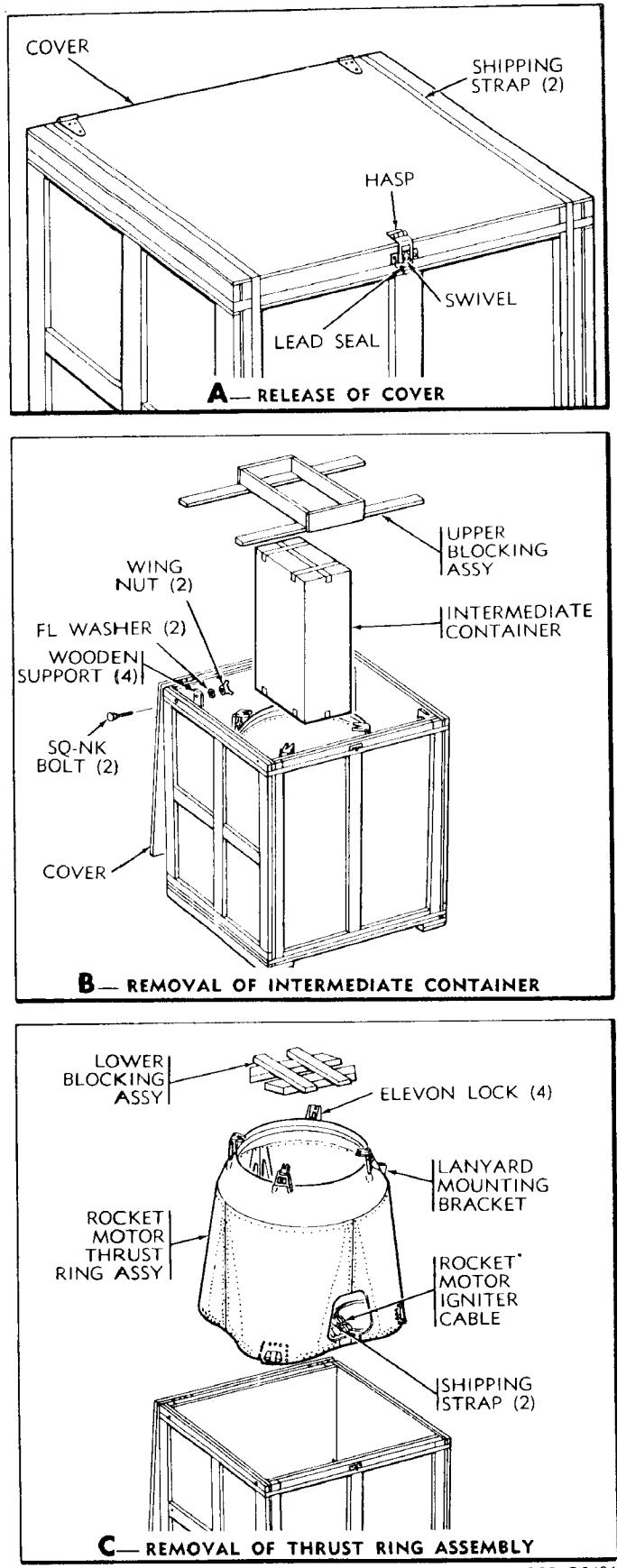


Figure 8-4. Uncrating rocket motor components shipping and storage box M36.

## 8-5. Uncrating the Rocket Motor Shipping and Storage Box

**Warning:** The rocket motor contains explosives. All applicable safety regulations will be strictly enforced. Operations involving the handling of explosive items will be performed only in the areas specifically designated. These areas will meet quantity-distance requirements based upon the type and quantity of explosives involved. Where adjacent missiles are a hazard, a barrier will be provided for protection. Do not perform handling operations during electrical storms.

**Warning:** Handling operations of the rocket motor will be supervised by qualified explosives personnel who thoroughly understand the hazards and risks involved. A minimum number of personnel will be permitted on or near the work location, and quantities of explosive materials will be kept to a minimum. Explosive materials spilled will be immediately removed, and the area thoroughly decontaminated before work continues.

**Warning:** Explosive components containing electrical wiring must be protected at all times from stray voltages or induced electrical currents. A ground strap with a maximum ground resistance of 20 ohms must be attached from the component to a grounding stake. A CO<sub>2</sub> fire extinguisher will be provided. Extreme care will be exercised when handling explosive components whose size or weight makes handling difficult.

**Caution:** The propellant grain and the metal parts of the rocket motor can be damaged unduly by rough handling or dropping. A rocket motor which has been subjected to such damage or to extreme temperature could cause a malfunction when the missile is fired. Rocket motors so exposed will not be used until a complete inspection of the grain for serviceability has been made.

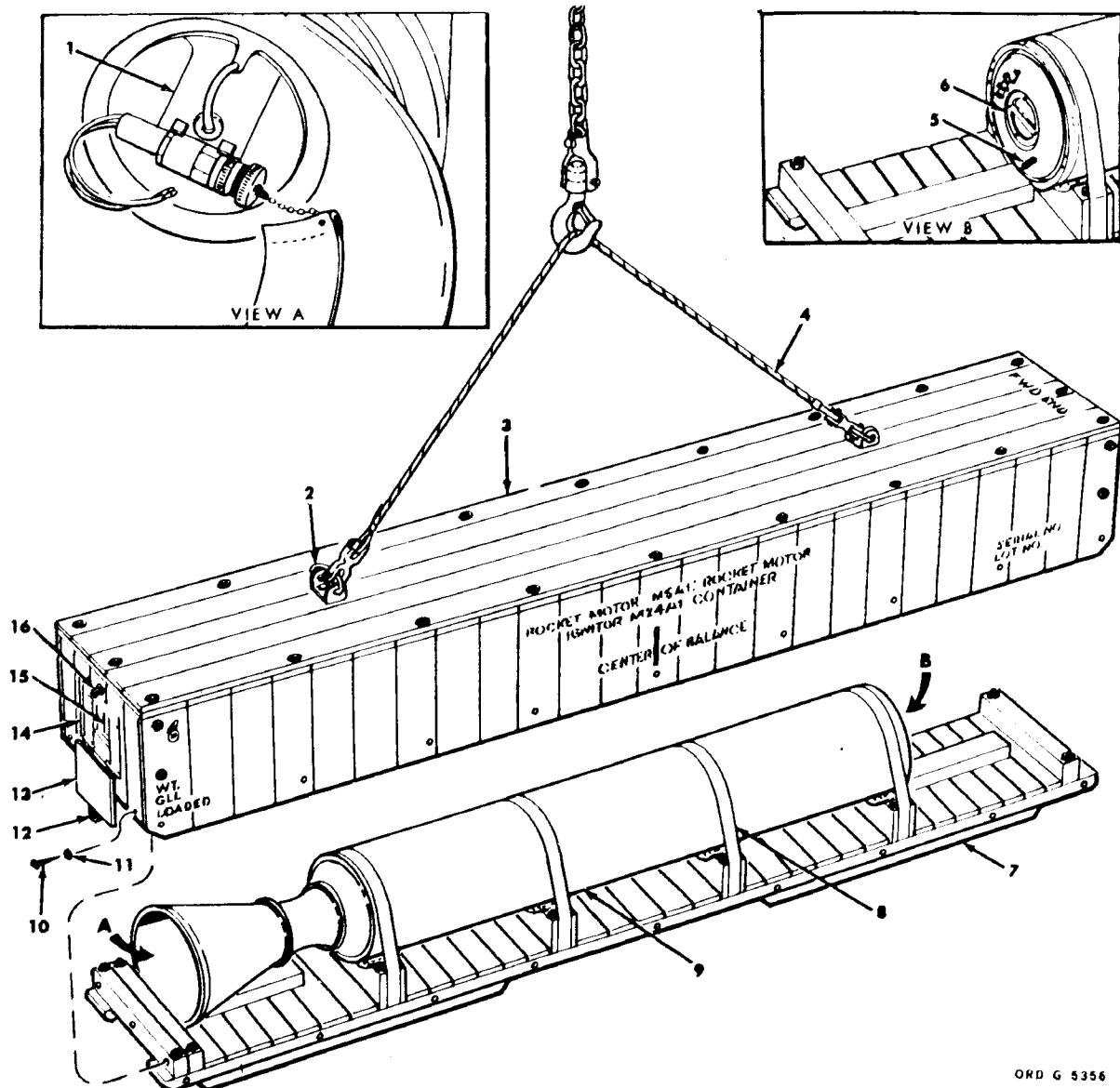
- a. Perform the inspection of rocket motor M5E1 shipping and storage box (par. 3-4).
- b. Break the lead seal on the end of the box.
- c. Turn the swivel (16, fig. 8-5) on the cover (3).

d. Release the hasp (12) on the access door (13) and open the door.

Note. If guided missile low-bed trailer M529 is to be used for transporting the missile, refer to fig. 9-14 for igniter storage.

e. Remove the rocket motor igniter container (15, fig. 8-5) from the igniter compartment (14). Store in the igniter storage area.

f. Close the access door, and secure with the hasp and swivel.



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1—Nozzle shipping closure	7—Base	13—Access door
2—Top lift point (2)	8—Shipping strap (4)	14—Igniter compartment
3—Cover	9—Rocket motor	15—Rocket motor igniter container
4—Hoist sling	10—Lag bolt (16)	16—Swivel
5—Pressure fitting cap	11—Flat washer (16)	
6—Igniter receptacle shipping closure	12—Hasp	

*Figure 8-5. Uncrating and inspecting the rocket motor.*

g. Cut the four shipping straps that secure the cover (3) to the base (7).

h. Remove the lag bolts (10) and flat washers (11) that secure the cover to the base.

i. Attach the hoist sling (4) to the top list points (2) on the cover.

j. Lift the cover from the base.

**WARNING:** Brown or red fumes emanating from the interior of the rocket motor indicate the presence of nitrous fumes within the rocket motor case. If fumes are present, evacuate the area immediately, and notify the proper authorities.

*Note.* The rocket motor must be grounded to a grounding stake having not more than 20 ohms resistance.

k. Inspect the rocket motor (9) as prescribed in (1) through (8) below.

(1) Inspect the rocket motor for visible damage. Ascertain that the rocket motor head and retaining ring are properly seated in the forward end of each rocket motor.

*Note.* Rocket motors evidencing improperly seated heads are to be reported to the direct support (DS) unit for disposition instructions.

(2) Inspect the igniter receptacle shipping closure (6) for proper installation.

(3) Use the spanner wrench, and remove the shipping closure from the igniter receptacle.

**WARNING:** Use a clean, explosion-proof flashlight when performing (4) below.

**WARNING:** Prior to inspection, turn on the flashlight to prevent possible ignition.

(4) Inspect the grain structure for cracks, evidence of moisture, unusual discoloration of the visible portion of the grain, and broken resonance rods. Inspect the heavy helical spring for proper seating between the rocket motor head and the resonance rod assembly (centered in the assembly).

*Note.* Minor rust or discoloration of the spring is not cause for rejection.

(5) Inspect the threads at the forward end of the rocket motor that are used for securing the igniter receptacle shipping closure or the rocket motor igniter.

(6) Install the shipping closure finger-tight.

(7) Check that the pressure fitting cap is tight.

(8) Inspect the nozzle shipping closure inside the nozzle at the rear end of the rocket motor to insure that it is not cracked or broken and is securely and completely cemented to the nozzle.

l. Repeat steps *a* through *k* above for the three remaining rocket motors.

## 8-6. Assembly of the Rocket Motor Cluster

*Note.* When procedures in chapter 8 call for the application of corrosion-preventive compound, use a soft-film, cold-application corrosion-preventive compound.

*a.* Position the lower-left fitting assembly (2, fig. 8-6) to the lower-right fitting assembly (3), and secure together with the four internal-wrenching bolts (5), four recessed washers (6), four (or as required, min. 1, max. 3 per bolt) flat washers (7), and four hexagon nuts (8).

*b.* Position the assembled lower-left and lower-right fitting assemblies on the supports (4).

*c.* Install the hexagon-head screws (9) and flat washers (10) to secure the two rear retaining rail bars (11) to the rear slippers (12).

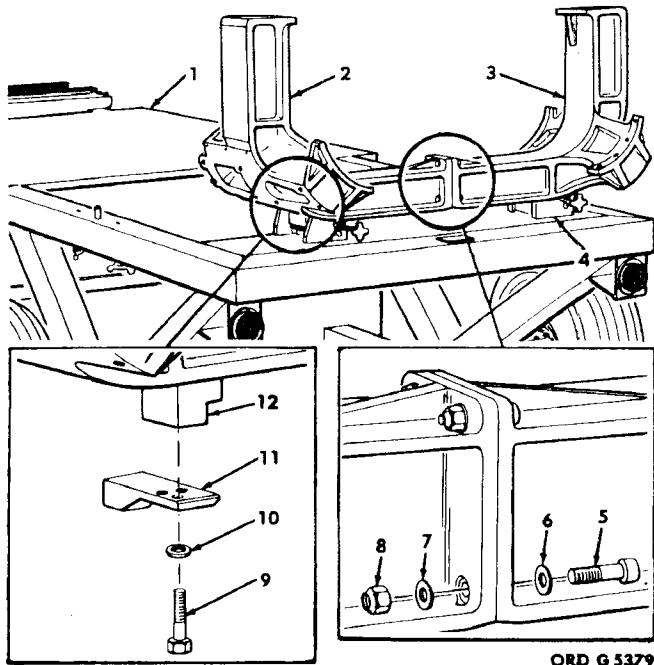
*d.* Cut the shipping straps (8, fig. 8-5) on the base (7) to position the attach holes and facilitate alignment with the lower left fitting assembly.

*Note.* Make certain that a hoisting device capable of lifting 6,000 pounds is used to install the rocket motor on the rocket motor cluster truck.

*f.* Attach the hoisting device to the rocket motor hoist beam (4, fig. 8-7).

*g.* Position the hoist beam over the rocket motor (5), and install the hoist slings (10) on the motor observing the centerline mark.

*h.* Lift the rocket motor (9, fig. 8-5) clear of the base (7).



- 1—Rocket motor cluster truck
- 2—Lower-left fitting assembly
- 3—Lower-right fitting assembly
- 4—Support (4)
- 5—3/8-24 x 1-3/4 int-wrenching bolt (4)
- 6—0.383-in-id recessed washer (4)
- 7—0.383-in-id fl washer (4)
- 8—3/8-24 hex nut (4)
- 9—7/16-14 x 1-1/2 hex-hd screw (4)
- 10—0.453-in-id fl washer (4)
- 11—Rear retaining rail bar (2)
- 12—Rear slipper (2)

*Figure 8-6. Removal and installation of the lower fitting assemblies.*

i. Install the hexagon-head bolt (3, fig. 8-7) and washer (2) to secure the forward slipper assembly (1) to the rocket motor forming ring (9). Tighten the bolt to the torque value given in the table 15-10.

j. Loosely install the internal-wrenching or hexagon-head bolt (8) and the recessed washer (7) to attach the forward retaining rail bar (6) to the forward slipper assembly (1).

k. Liberally coat with corrosion-preventive compound the mating surfaces of the rocket motor (1, fig. 8-8) that will be installed in the 4 position, and the lower-left fitting assembly (2).

l. Position the rocket motor into the 4 position on the lower left fitting assembly (2). Block the forward end of the rocket motor to prevent rolling.

m. Loosely install the hexagon-head bolts (5), lockwashers (4), and flat washers (3) to secure the motor on the fitting assembly (2); do not tighten the bolts.

n. Remove the hoist slings from the rocket motor, and lift the hoist beam clear.

o. Prepare to install the rocket motor in the 3 position as prescribed in *d* through *j* above.

p. Liberally coat with corrosion-preventive compound the mating surfaces of the rocket motor that will be installed in the 3 position, and the lower-right fitting assembly (2).

q. Position the rocket motor in the 3 position on the lower-right fitting assembly. Block the forward end of the rocket motor to prevent rolling.

r. Loosely install the hexagon-head bolts (5), lockwashers (4), and flat washers (3) to secure the rocket motor in the 3 position on the lower right fitting assembly. Do not tighten the bolts.

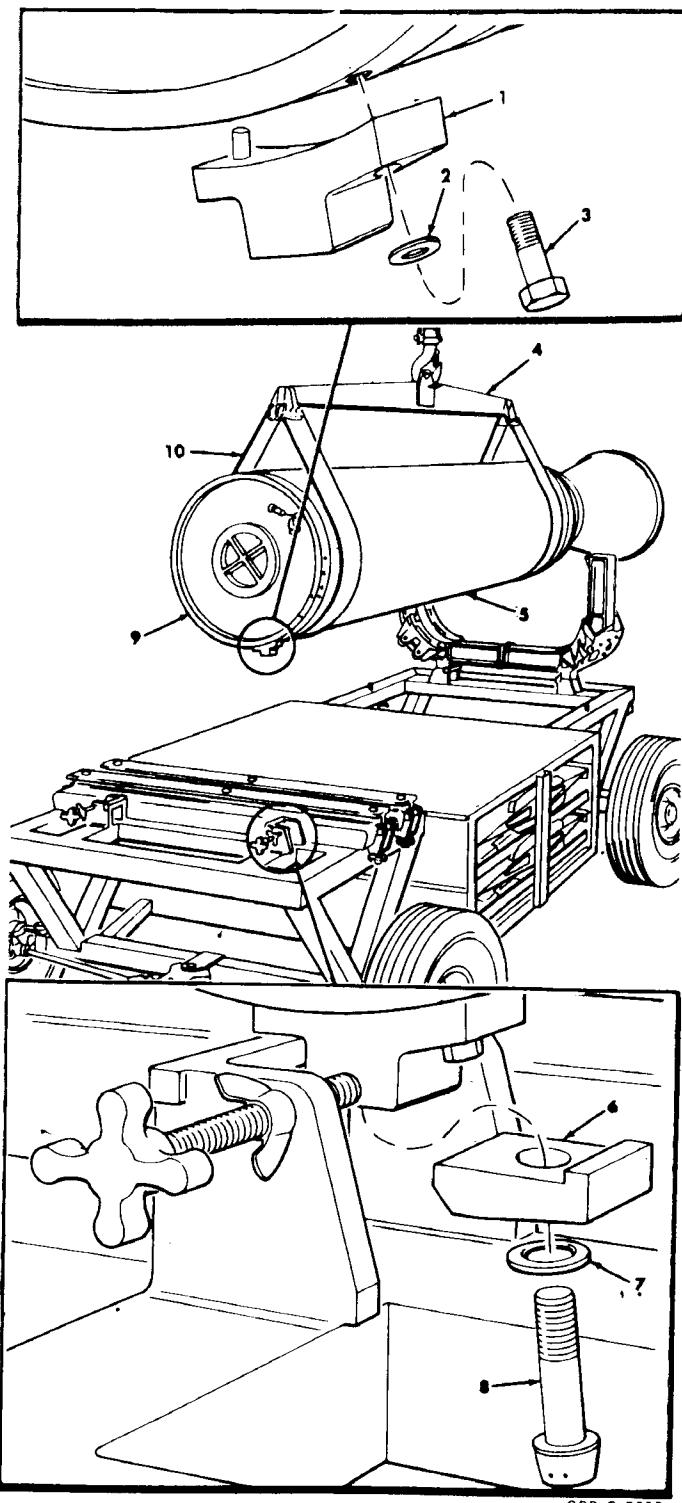
s. Remove the hoist slings from the rocket motor, and lift the hoist beam clear.

t. Liberally coat the mating surfaces of the rocket motor thrust ring assembly (6, fig. 8-9) and the rocket motors in the 3 and 4 position with corrosion-preventive compound.

u. Make certain that the lanyard mounting bracket (1) on the thrust ring assembly is oriented at the top before lifting. Lift and position the thrust ring assembly on the forward end of the rocket motors installed in the 3 and 4 positions.

v. Install (finger tight) eight internal-wrenching bolts (2) and recessed washers (3) to the inside of the thrust ring assembly; install (fingertight) four internal-wrenching bolts (8) and recessed washers (7) to the outside of the thrust ring assembly.

w. Prepare to install the rocket motor in the 2 position as prescribed in *d* through *h* above.

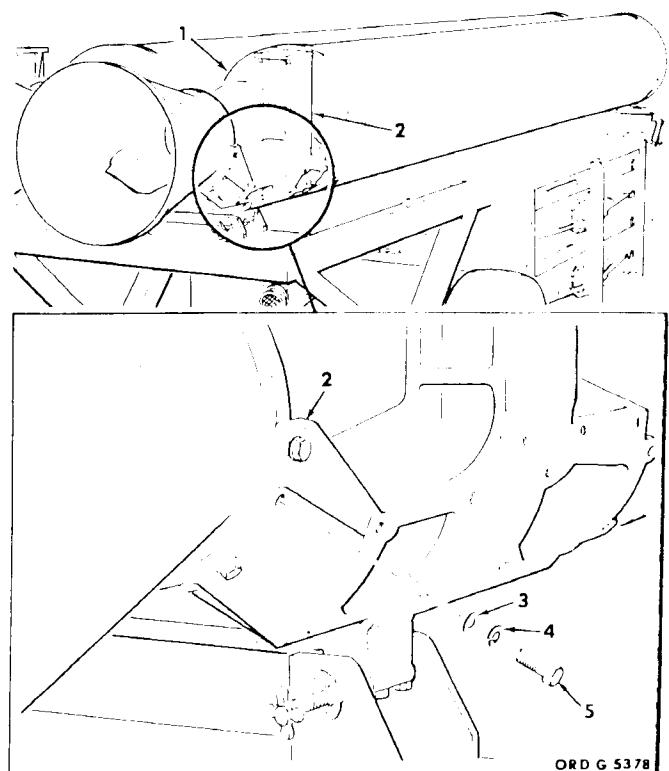


1—Forward slipper assembly  
 2—25/64-in-id fl washer  
 3—3/8-24 x 1-13/64 hex-hd bolt  
 4—Rocket motor hoist beam  
 5—Rocket motor

Figure 8-7. Positioning the rocket motor.

6—Forward retaining rail bar  
 7—0.636-in-id recessed washer  
 8—5/8-18 x 2-9/16 in-wrenching bolt or 5/8-18 x 2-11/32 hex-hd bolt  
 9—Rocket motor forming ring  
 10—Hoist sling (2)

Figure 8-7—Continued.



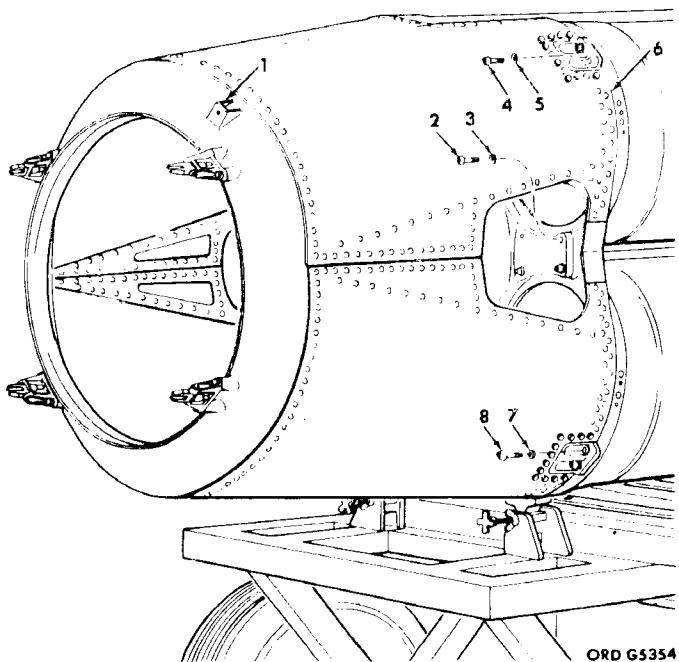
1—Rocket motor  
 2—Lower-right fitting assembly  
 3—13/32-in-id fl washer (8)  
 4—3/8 in. lockwasher (8)  
 5—3/8-24 x 61/64 hex-hd bolt (8)

Figure 8-8. Removal and installation of the rocket motor in the 3 and 4 position—typical.

x. Liberally coat with corrosion-preventive compound the mating surfaces of the rocket motor that will be installed in the 2 position, and the upper-right fitting assembly (9, fig. 8-10).

y. Position the upper-right fitting assembly on the rocket motor (11), and loosely install the hexagon-head bolts (2), lockwashers (3) and flat washers (4). Do not tighten the bolts.

z. Liberally coat with corrosion-preventive compound the mating surfaces of the rocket thrust ring assembly (16), and the rocket motor that will be installed in the 2 position.



- 1 — Lanyard mounting bracket
- 2 — 7/16-20 x 2 int-wrenching bolt (8)
- 3 — 0.446-in-id recessed washer (12)
- 4 — 7/16-20 x 1 1/4 int-wrenching bolt (4)
- 5 — 0.446-in-id recessed washer (12)
- 6 — Rocket motor thrust ring assembly
- 7 — 0.446-in-id recessed washer (12)
- 8 — 7/16-20 x 1 1/4 int-wrenching bolt (8)

*Figures 8-9. Removal and installation of the rocket motor thrust ring assembly — typical.*

**CAUTION:** Do not disconnect the hoist beam from the rocket motor (11) until both the forward and rear ends of the motor are secured.

*aa.* Position the rocket motor into the 2 position as prescribed in (1) through (5) below.

(1) Lower and guide the rocket motor until the forward end is seated properly inside of the rocket motor thrust ring assembly and the rear end is in place directly over the 3 rocket motor (12).

(2) Align the upper-right fitting assembly with the lower-right fitting assembly.

(3) Install the four internal-wrenching bolts (5), four recessed washers (6), four (or as required, min 1, max. 3 per bolt) washers (7), and four hexagon nuts (8) to secure the upper-right fitting assembly (9) to the lower-right fitting assembly.

(4) Install (fingertight) four internal-wrenching bolts (2, fig. 8-9) and recessed washers (3) to the inside of the thrust ring assembly (6); install (fingertight) two internal-wrenching bolts (4) and recessed washers (5) to the outside of the thrust ring assembly.

(5) Remove the hoist slings from the rocket motor, and list the hoist beam clear.

*ab.* Prepare to install the rocket motor into the 1 position as prescribed in *ac* through *ag* below.

*ac.* Liberally coat with corrosion-preventive compound the mating surfaces of the rocket motor that will be installed in the 1 position (10, fig. 8-10), and the upper-left fitting assembly (15).

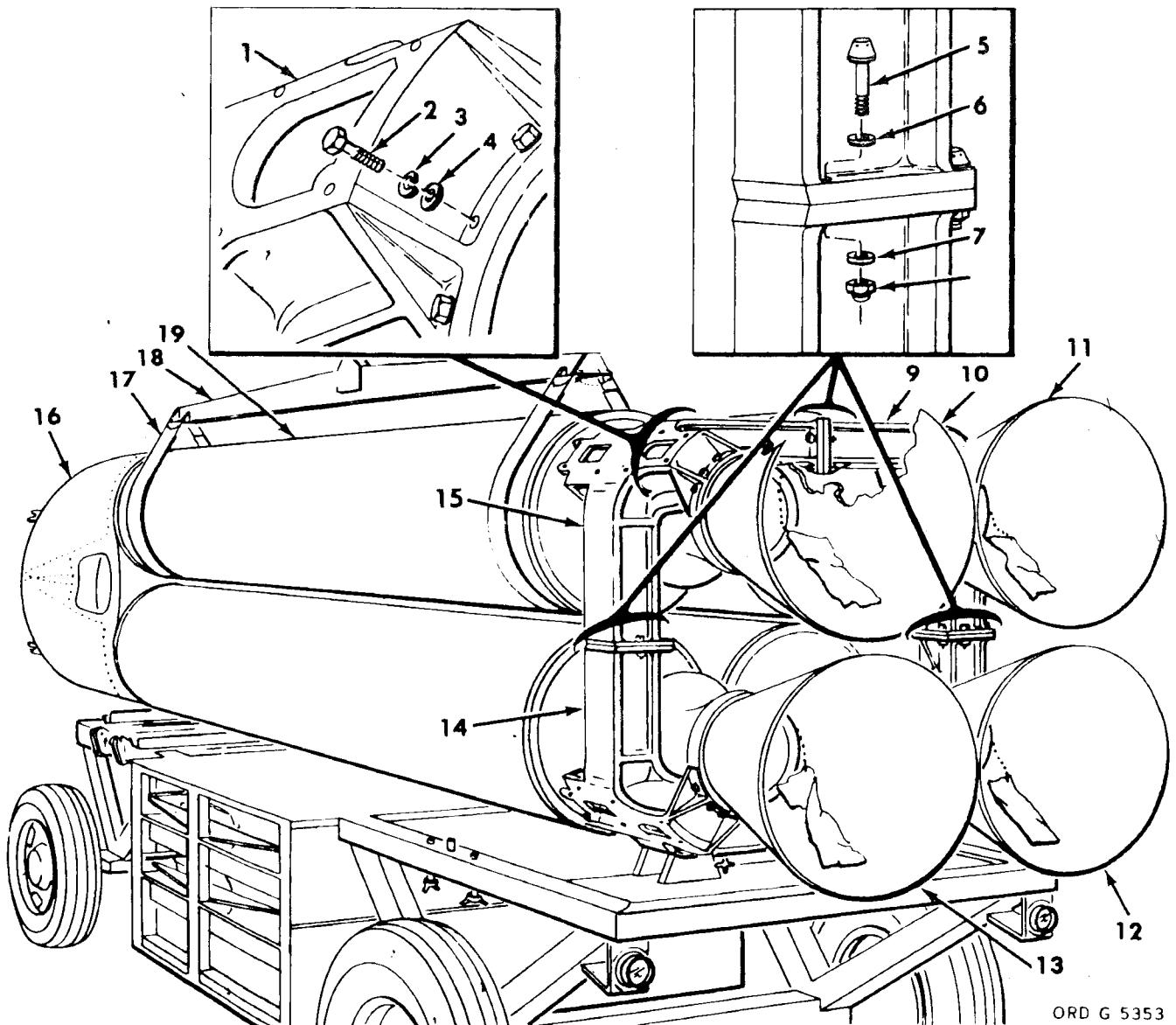
*ab.* Position the upper-left fitting assembly on the rocket motor (10), and loosely install the hexagon-head bolts (2), lockwashers (3), and flat washers (4). Do not tighten the bolts.

*ae.* Liberally coat with corrosion-preventive compound the mating surfaces of the rocket motor thrust ring assembly (16) and the rocket motor that will be installed in the 1 position.

**CAUTION:** Do not disconnect the hoist beam from the rocket motor until both the forward and rear ends of the motor are secured.

*af.* Position the rocket motor into the 1 position (10) as prescribed in (1) through (5) below.

(1) Lower and guide the rocket motor until the forward end is seated properly inside the rocket motor thrust ring assembly and the rear end is in place directly over



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- 1—Upper-left fitting assembly
- 2—3/8-24 x 61/64 hex-hd bolt
- 3—3/8-in lockwasher
- 4—13/32-in-id fl washer
- 5—3/8-24 x 1-3/4 int-wrenching bolt
- 6—0.383-in-id recessed washer
- 7—0.383-in-id fl washer
- 8—3/8-24 hex nut
- 9—Upper right fitting assembly
- 10—Rocket motor in 1 position

- 11—Rocket motor in 2 position
- 12—Rocket motor in 3 position
- 13—Rocket motor in 4 position
- 14—Lower-left fitting assembly
- 15—Upper-left fitting assembly
- 16—Rocket motor thrust ring assembly
- 17—Hoist sling
- 18—Rocket motor hoist beam
- 19—Rocket motor

*Figure 8-10. Positioning the rocket motor in position—typical.*

the 4 rocket motor (13).

(2) Align the upper-left fitting assembly (15) with the lower left fitting assembly (14).

(3) Install the four internal-wrenching bolts (5), four recessed washers (6), four (or as required, min. 1, max. 3 per bolt) flat washers (7), and four hexagon nuts (8)

to secure the upper-left assembly (15) to the lower-left fitting assembly (14).

(4) Install (fingertight) four internal-wrenching bolts (2, fig. 8-9) and recessed washers (3) to the inside of the thrust ring assembly (6); install (fingeright) two internal-wrenching bolts (4) and recessed washers (5) to the outside of the thrust ring assembly.

(5) Remove the hoist slings from the rocket motor and lift the hoist beam clear.

*ag.* Align the upper-left fitting assembly (15, fig. 8-10) to the upper right fitting assembly (9), and secure together with the four internal-wrenching bolts (5), four recessed washers (6), four (or as required min. 1, max. 3 per bolt) washers (7), and four hexagon nuts (8).

*ah.* Tighten all bolts, screws, and nuts in *a* through *ag* above to the torque values as given in table 15-10.

*ai.* Join the four nozzle fairings (1, 2, 6, and 9, fig. 8-11) together as prescribed in (1) through (4) below.

*Note.* The left nozzle fairing (9) and the top nozzle fairing (1) are identical and identified by the same part number. The bottom nozzle fairing (6) may be identified by one full and one half recess on the forward edge, which recesses mate with the rear slippers, which are an integral part of the two lower fitting assemblies. The right nozzle fairing (2) may be identified by a half recess on the forward left edge.

(1) Join the nozzle fairings (6) and (9) together, with the nozzle fairing (9) overlapping nozzle fairing (6) at the band clamp (8); install (fingertight) three fillister-head screws (7).

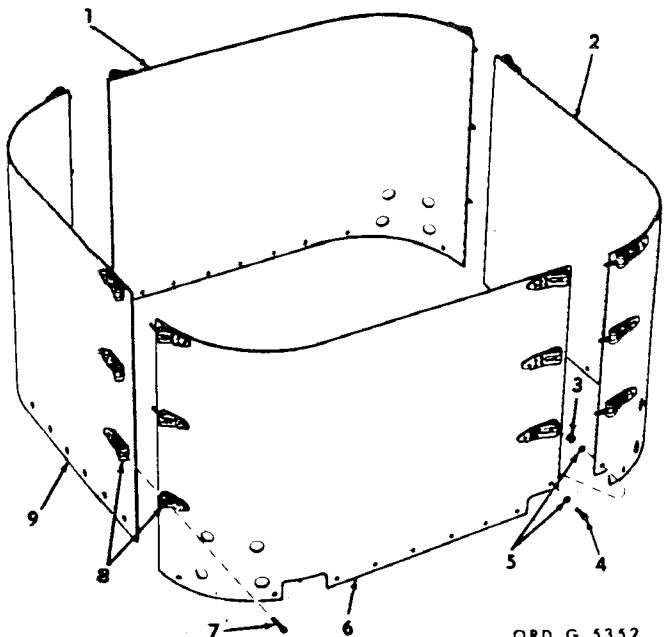
(2) Join the nozzle fairings (6) and (2) together, with the nozzle fairing (6) overlapping nozzle fairing (2) at the band clamp (8); install (fingertight) three fillister-head screws (7).

(3) Join the nozzle fairings (1) and (2) together, with the nozzle fairing (2) overlapping the nozzle fairing (1) at the band clamp (8). Install (fingertight) three fillister-head screws (7).

(4) Join the nozzle fairings (9) and (1) together, with the nozzle fairing (1) overlapping the nozzle fairing (9) at the band clamp (8). Install (fingertight) three fillister-head screws (7).

(5) Install the hexagon-head bolt (4), two flat washers (5), and hexagon nut (3) through the aligned holes in nozzle fairings (2) and (6).

*aj.* Tape (3, fig. 8-12) the four filler



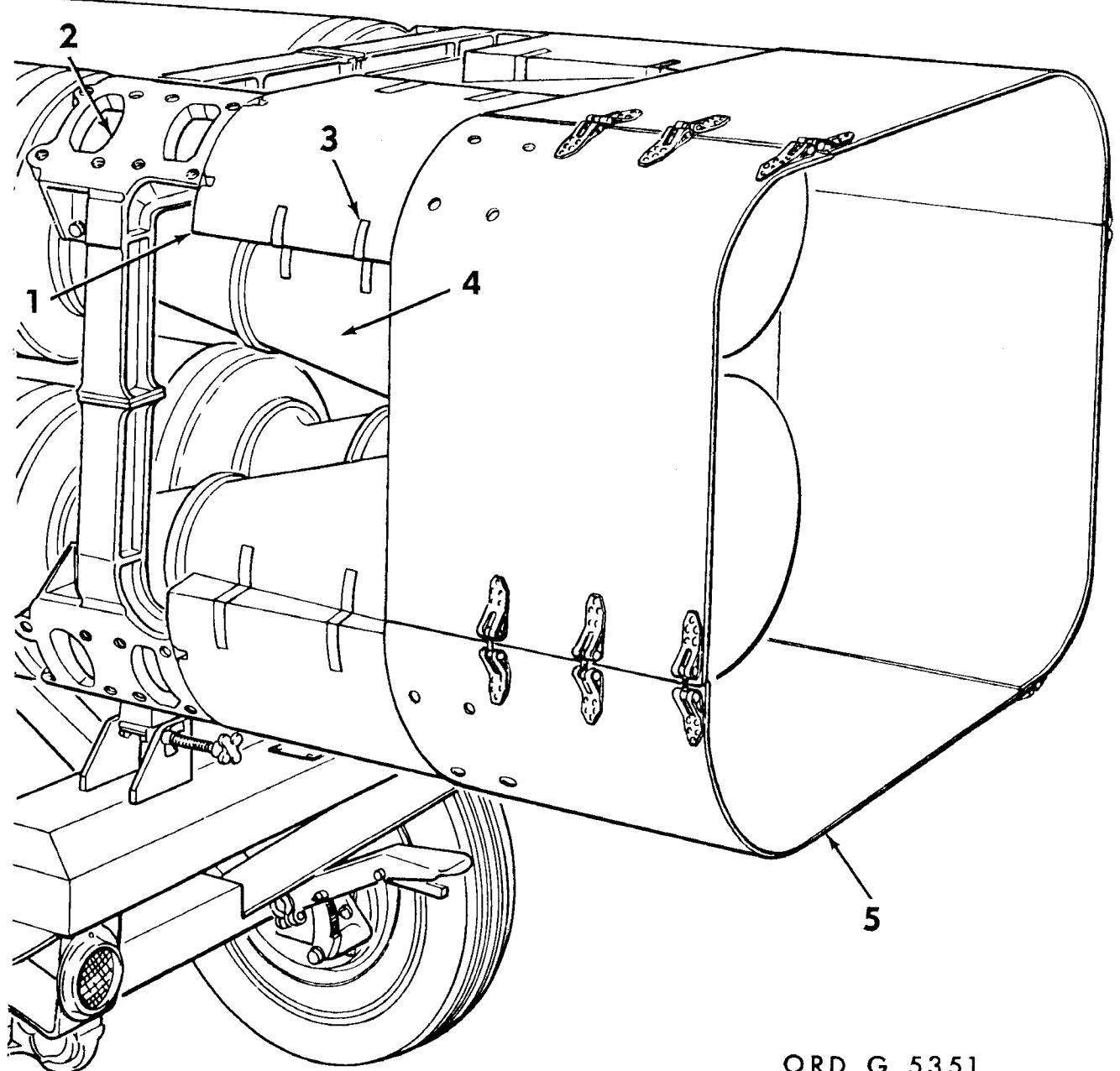
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- 1—Nozzle fairing 8166293
- 2—Nozzle fairing 8166292
- 3—1/4-28 hex nut
- 4—1/4-28 x 17/32 hex-hd bolt
- 5—0.265-in-id fl washer (2)
- 6—Nozzle fairing 8166278
- 7—1/4-28 x 1-1/2 fil-hd screw (12)
- 8—Band clamp (12)
- 9—Nozzle fairing 8166293

Figure 8-11. Disassembly and assembly of the nozzle fairings.

blocks (1) in position, one on each rocket motor nozzle (4), flush with each fitting assembly (2).

*ak.* Liberally coat the mating surfaces of the fitting assemblies and the assembled nozzle fairings (5) with corrosion-preventive compound.



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1—Filler block (4)  
 2—Fitting assembly (4)  
 3—Tape

4—Rocket motor nozzle (4)  
 5—Assembled nozzle fairings

*Figure 8-12. Removal and installation of the nozzle fairings.*

aL. Position the assembled nozzle fairings over the nozzles of the assembled rocket motors. Slide the assembled nozzle fairings

forward until the attach holes on the forward end of the assembled nozzle fairings are alined with the attach holes in the fitting assemblies. ■

*am.* Liberally coat the mating surfaces of the forward nozzle fairings (1, fig. 8-13), the fitting assemblies (2, fig. 8-12), and the rocket motor forming ring (9, fig. 8-7) with corrosion-preventive compound.

*an.* Position the four forward nozzle fairings. Align the attach holes in the forward nozzle fairings with the attach holes in the rocket motors; tape the forward nozzle fairings in position.

*Note.* The top fairing wedge (3, fig. 8-14) has two lift point holes. The bottom fairing wedge (8) has a notch at each rear corner. The side fairing wedges (5, fig. 8-13) are identical.

*ao.* Liberally coat the mating surfaces of the side fairing wedges, and the rocket motor forming ring, the forward nozzle fairings, and the assembled nozzle fairings (4, fig. 8-13) with corrosion-preventive compound.

*ap.* Position the two side fairing wedges overlapping the four forward nozzle fairings and the assembled nozzle fairings; secure the two side fairing wedges and the four forward nozzle fairings to the fitting assemblies (2, fig. 8-12) with 12 hexagon-head bolts (7, fig. 8-13), and flat washers (8). Secure the two side fairing wedges and the assembled nozzle fairings (4) to the fitting assemblies (2, fig. 8-12) with 16 hexagon-head bolts (7, fig. 8-13), and washers (8); tighten the bolts fingertight.

*aq.* Liberally coat the mating surfaces of the top fairing wedge (3, fig. 8-14), assembled nozzle fairings (6), the rocket motors, and the forward nozzle fairings (7), with corrosion-preventive compound.

*ar.* Position the top fairing wedge, overlapping the two forward nozzle fairings and the assembled nozzle fairings. Secure the top fairing wedge and the two forward nozzle fairings to the fitting assemblies ((2) fig. 8-12) with six hexagon-head bolts (4, fig. 8-

14) and flat washers (5); secure the top fairing wedge and the assembled nozzle fairing to the fitting assemblies with eight hexagon bolts (4) and flat washers (5); tighten the bolts fingertight.

*as.* Liberally coat the mating surfaces of the bottom fairing wedge (8), the assembled nozzle fairings, the rocket motors, and the forward nozzle fairings with corrosion preventive compound.

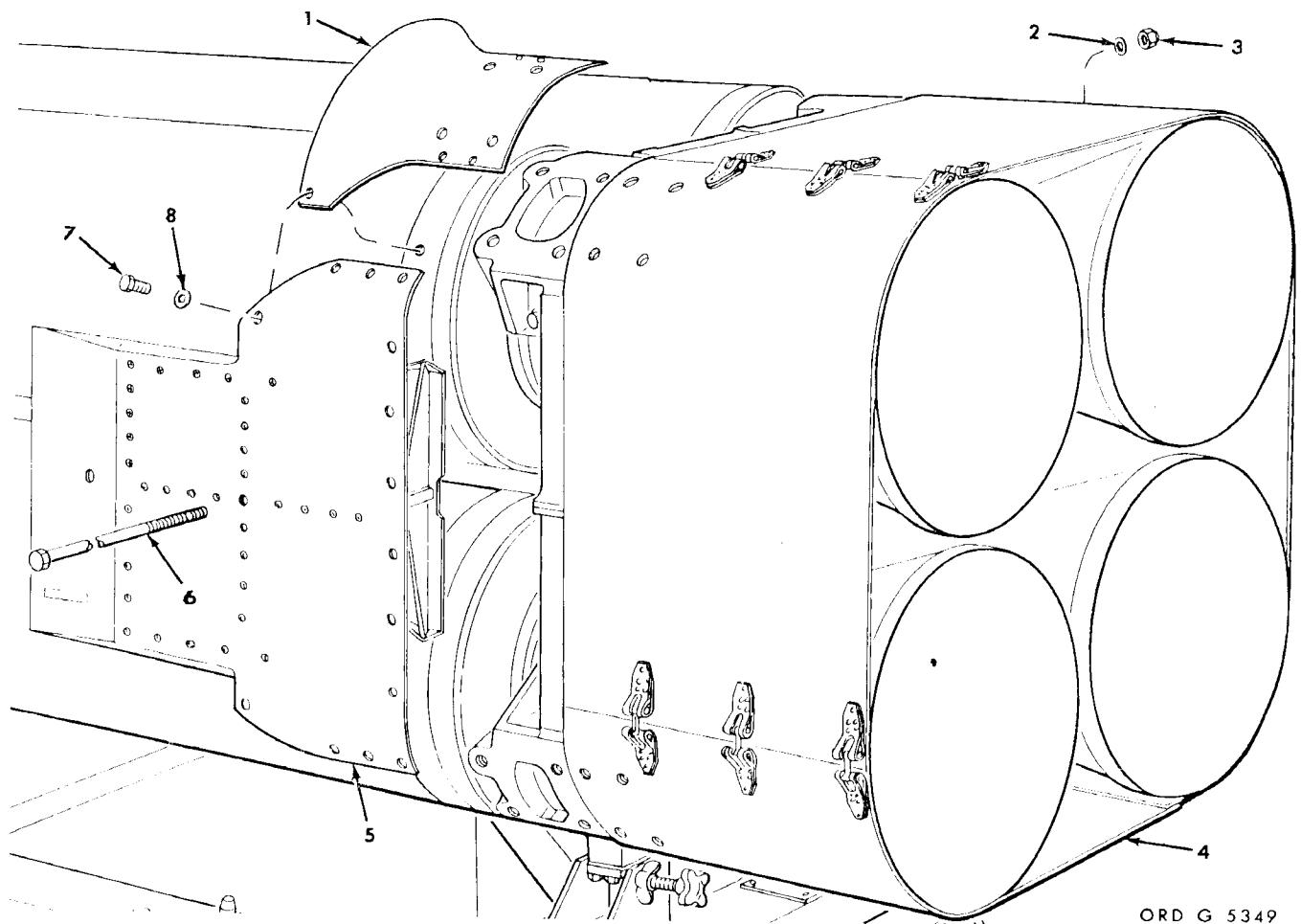
*at.* Position the bottom fairing wedge overlapping the two forward nozzle fairings and the assembled nozzle fairings. Secure the bottom fairing wedge and the two forward nozzle fairings to the fitting assemblies with six hexagon-head bolts (10) and flat washers (9); secure the bottom fairing wedge and the assembled nozzle fairing to the fitting assemblies with six hexagon-head bolts (10) and flat washers (9); tighten the bolts finger tight.

*au.* Loosely install the two hexagon-head bolts (6, fig. 8-13), flat washers (2), and hexagon nuts (3) through the side fairing wedges (5); loosely install two hexagon-head bolts (11, fig. 8-14), flat washers (2), and hexagon nuts (1) through the top (3) and the bottom fairing wedges (8), with the bolt heads underneath.

*av.* Position the two rocket motor cluster fin assemblies (3, fig. 8-15) on the upper side of the rocket motor cluster. Secure with the eight hexagon-head bolts (1) and flat washers (2) to each fin. Torque all hardware to the values specified in table 15-10.

*Note.* When misalignment or interference with the eyebolt flange prevents the proper insertion of the eyebolts, rework the top wedge (3, fig. 8-14) as prescribed in paragraph 8-7w and x.

*aw.* Tighten the adjusting bolt (18, fig. 9-3) and the locknut (19) at each support (14 and 17) on the track.

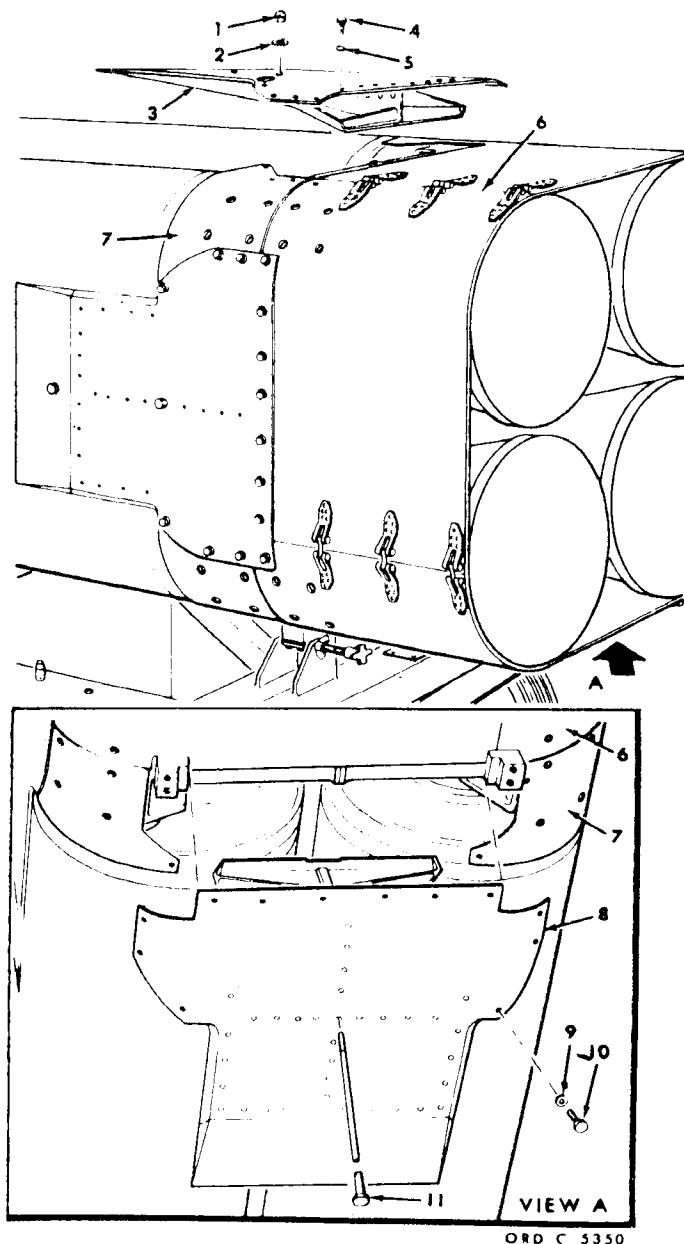


1—Forward nozzle fairing (4)  
 2—25/64-in-id fl washer (2)  
 3—3/8-24 hex nut (2)

4—Assembled nozzle fairings  
 5—Side fairing wedge (2)  
 6—3/8-24 X 35-1/2 hex-hd bolt (2)

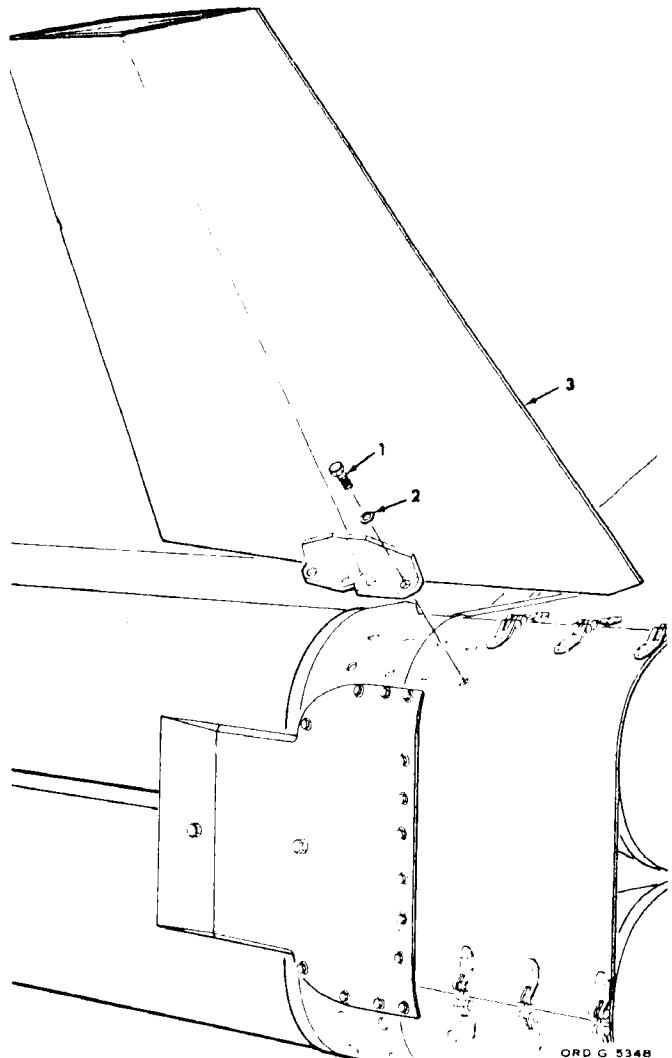
7—1/4-28 X 17/32 hex-hd bolt (28)  
 8—9/32-in-id fl washer (28)

*Figure 8-13. Removal and installation of the forward nozzle fairings and side fairing wedges.*



- 1—3/8-24 hex. nut (2)
- 2—25/64-in-id fl washer (2)
- 3—Top fairing wedge
- 4—1 1/4-28 x 17/32 hex-hd bolt (14)
- 5—9/32-in-id fl washer (14)
- 6—Assembled nozzle fairings
- 7—Forward nozzle fairing (4)
- 8—Bottom fairing wedge
- 9—9/32-in-id fl washer (12)
- 10—1 1/4-28 x 17/32 hex-hd bolt (12)
- 11—3/8-24 x 35-1/2 hex-hd bolt (2)

*Figure 8-14. Removal and installation of the top and bottom fairing wedges.*



- 1—1 1/2-20 x 1-19/32 hex-hd bolt (16)
- 2—33/64-in-id fl washer (16)
- 3—Rocket motor cluster fin assembly (2)

*Figure 8-15. Removal and installation of the upper fin assemblies.*

## 8-7. Uncrating and Inspecting the Assembled Rocket Motor Cluster

**WARNING:** The rocket motor cluster contains explosives. All applicable safety regulations will be strictly enforced. Operations involving the handling of explosive items will be performed only in the area specifically designated. These areas will meet quantity-distance requirements based upon the type and quantity of explosives involved. Where adjacent missiles are a hazard, a barrier will be provided for protection. Do not perform handling operations during electrical storms.

**WARNING:** Handling operations of the rocket motor cluster will be supervised by qualified explosives personnel who thoroughly understand the hazards and risks involved. A minimum number of personnel will be permitted on or near the work location, and quantities of explosive materials will be kept to a minimum. Spilled explosive materials will be immediately removed, and the area thoroughly decontaminated before work continues.

**WARNING:** Explosive components containing electrical wiring must be protected at all times from stray voltages or induced electrical currents. A ground strap with a maximum ground resistance of 20 ohms must be attached from the component to a grounding stake. A CO<sub>2</sub> fire extinguisher will be provided. Extreme care will be exercised when handling explosive components whose size or weight makes handling difficult.

**CAUTION:** The propellant grain and the metal parts of the rocket motor cluster can be damaged unduly by rough handling or dropping. A rocket motor which has been subjected to such damage or to extreme temperature could cause a malfunction when the missile is fired. Rocket motors so exposed will not be used until a complete inspection of the grain for serviceability has been made.

a. Perform the inspection of the rocket motor cluster shipping and storage box (par. 3-4).

b. Cut and remove all the lead seals.

c. Cut and remove the banding straps.

d. Remove the squarehead lag bolts (fig. 8-16) and flat washers that secure the cover to the base.

e. Position a hoisting device capable of lifting 6,000 pounds over the cover.

f. Remove the square nuts and flat washers from the studs on the base, and disengage the sling assemblies, if present, from the studs.

g. Turn the swivel on the cover fastener, and release the hasp.

h. Remove the cover and place in the storage area.

i. Remove the screws (fig. 8-17) and flat washers that secure the strap over the rocket motor igniter containers.

*Note.* If guided missile low-bed trailer M529 is to be used for transporting the missile, refer to figure 9-14 for igniter storage.

j. Remove the four rocket motor igniter containers (fig. 8-17), and store in the igniter storage area.

**WARNING:** Brown or red fumes emanating from the interior of the rocket motor indicates the presence of nitrous fumes within the rocket motor case. If the fumes are present, evacuate the area immediately and notify the supervisor.

*Note.* During handling operations the rocket motor must be grounded to a grounding stake having not more than 20 ohms resistance.

k. Inspect each rocket motor (9, fig. 8-5) as prescribed below.

(1) Inspect the rocket motor for external damage.

(2) Inspect the igniter receptacle shipping closure (A, fig. 10-9) for proper installation.

(3) Remove the igniter receptacle shipping closure.

**WARNING:** Use an explosion-proof flashlight when performing step (4) below.

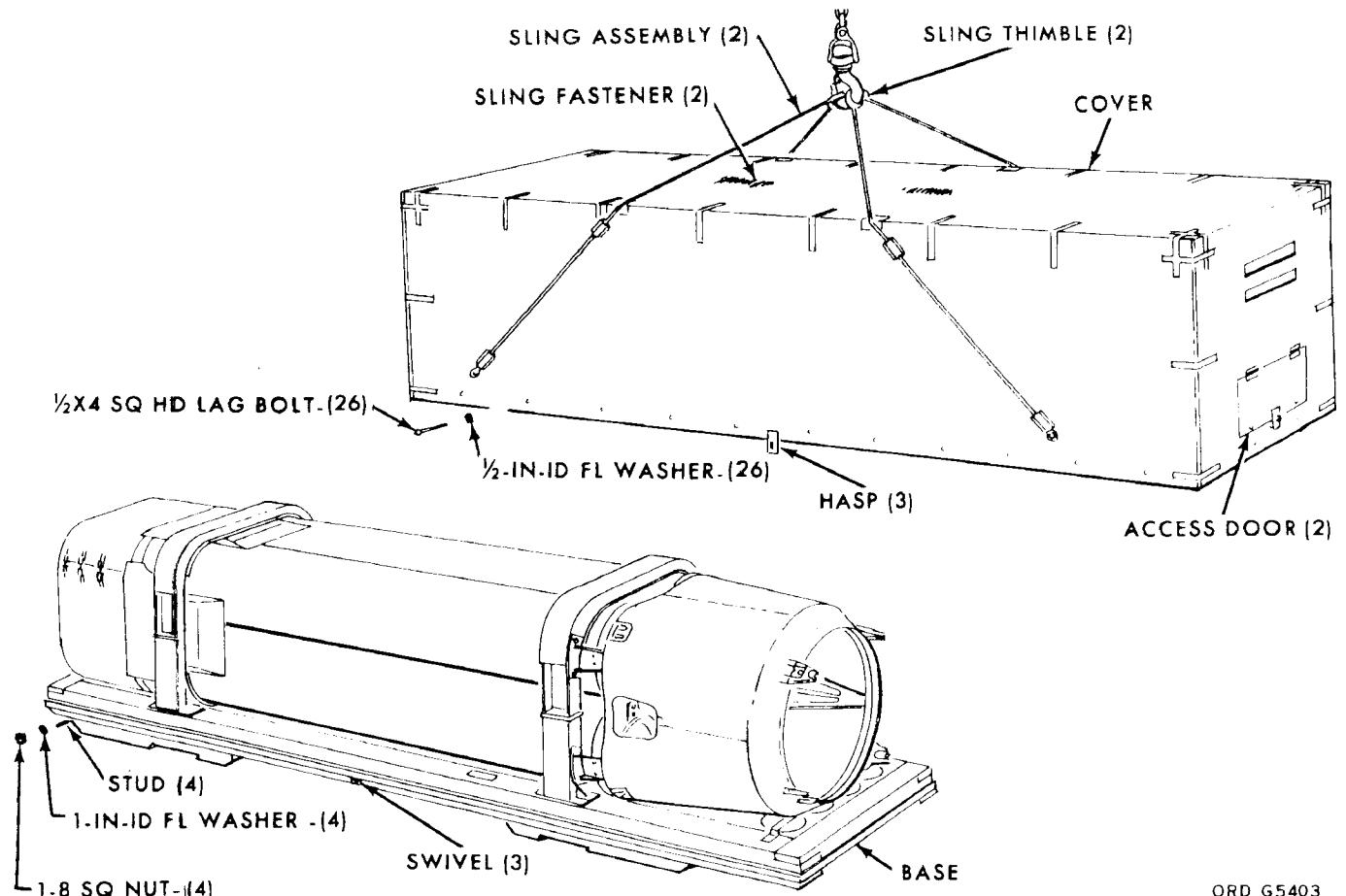
**WARNING:** Prior to the inspection, turn on the flashlight to prevent possible ignition.

(4) Inspect the grain structure for cracks, evidence of moisture, unusual discoloration of the visible portion of the grain, and broken resonance rods.

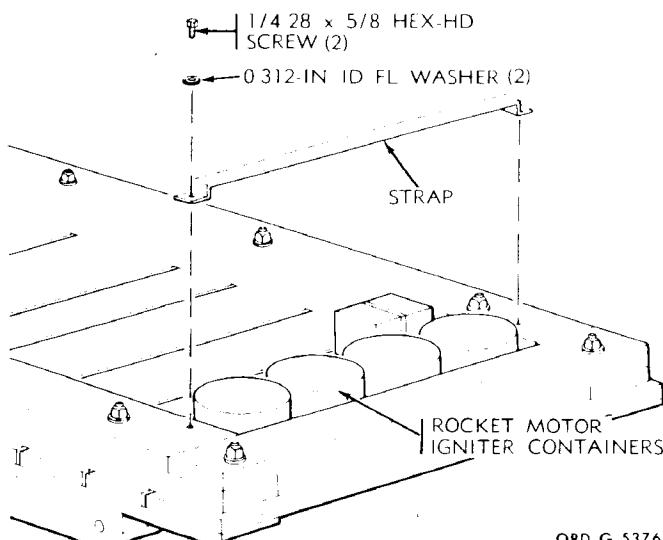
(5) If the rocket motors are M5E1, perform (a) through (e) below.

(a) Inspect the exposed portion of the internal harness assembly for deterioration or damage. If the harness assembly is deteriorated or damaged, perform (b) through (e) below.

(b) Remove the electrical connector of the harness assembly from the nozzle closure retaining clip.



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*Figure 8-16. Removal and installation of the rocket motor cluster shipping and storage box cover.*

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*Figure 8-17. Removal and installation of rocket motor igniter container.*

(c) Using a knife or electrician's side-cutting pliers, cut the harness assembly 2 inches to the rear of the nozzle closure.

(d) Tape the end of the harness with electrician's tape.

(e) Remove and retain the shorting connector.

(6) Inspect the four elevon locks (C, fig. 8-4) and the lanyard mounting bracket on the forward end of the rocket motor thrust ring assembly for damage.

(7) Inspect the threads at the forward end of the rocket motor which secure the igniter receptacle shipping closures or the rocket motor igniter.

(8) Report any damaged or missing parts to the supervisor.

(9) Install the igniter receptacle shipping closure.

(10) Check that the pressure fitting cap (5, fig. 8-5) is tight.

(11) Check the nozzle shipping closure (1) to insure that it is not cracked or broken and is securely and completely cemented to the nozzle.

(12) If the nozzle closure is not securely attached to the motor nozzle, proceed as follows:

(a) Using sparkproof tools, separate the loose or damaged nozzle closure from the nozzle.

**CAUTION:** Do not damage the finish of the nozzle.

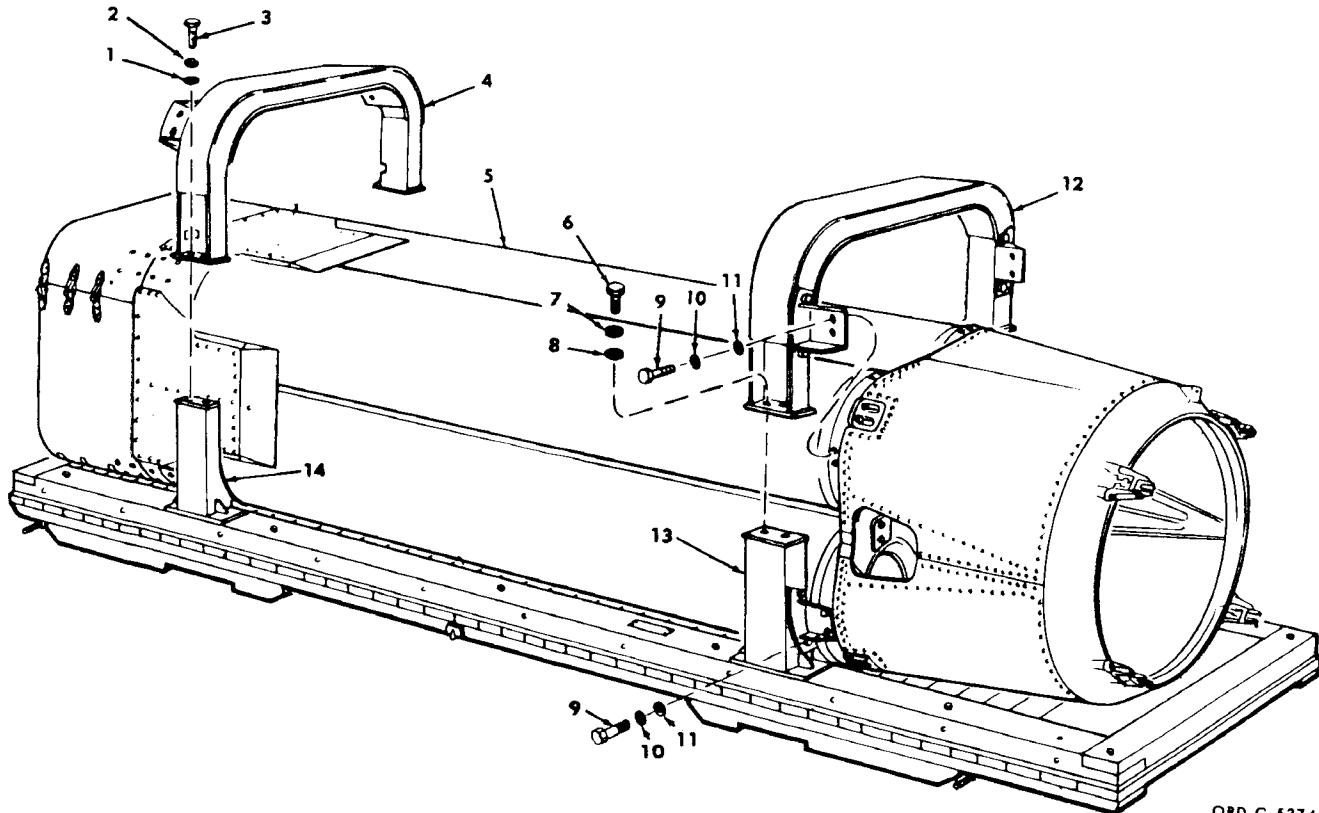
(b) Using copper or aluminum wool, clean the sealant and closure residue from the surface of the nozzle.

(c) Seal the nozzle closure in place with sealing compound MPD 5010.

**WARNING:** The rocket motor cluster must be grounded to a grounding stake having not more than 20 ohms resistance.

.l. Remove the hexagon-head screws (6, fig. 8-18), internal-teeth lockwashers (7), and flat washers (8) that secure the forward clamp assembly (12) to the forward cradle assembly (13).

.m. Remove the hexagon-head screws (9), internal-teeth lockwashers (10), and flat-



1—5/8 in. fl washer (4)  
2—5/8-in. int-teeth lockwasher (4)  
3—5/8-18 x 1-3/4 hex-hd screw (4)  
4—Rear clamp assembly  
5—Rocket motor cluster

6—5/8-18 x 1-3/4 hex-hd screw (4)  
7—5/8-in. int-teeth lockwasher (4)  
8—5/8-in. fl washer (4)  
9—5/8-18 x 1-1/4 hex-hd screw (8)  
10—5/8-in. int-teeth lockwasher (8)

11—5/8-in. fl washer (8)  
12—Forward clamp assembly  
13—Forward cradle assembly  
14—Rear cradle assembly

Figure 8-18. Removal and installation of the clamp assemblies.

washers (11) that secure the forward clamp assembly (12) and the forward cradle assembly (13) to the rocket motor cluster (5).

*n.* Remove the forward clamp assembly.

*o.* Remove the hexagon-head screws (3), internal-teeth lockwashers (2), and flat washers (1) that secure the rear clamp assembly (4) to the rear cradle assembly (14).

*o.1.* Remove the hexagon-head screws (9), internal-teeth lockwashers (10), and flat washers (11) that secure the rear clamp assembly (4) and the rear cradle assembly (14) to the rocket motor cluster.

*p.* Place the screws and washers removed in *m* and *o.1* above in a bag.

*q.* Remove the rear clamp assembly.

**CAUTION:** Make certain that a hoisting device capable of lifting 6,000 pounds is used to hoist the rocket motor cluster from the box.

*r.* Attach the falling hook (6, fig. 9-3) to the rocket motor cluster hoist beam (7).

*s.* Remove the four plugs (2) from the lift points.

*t.* Lower the hoist beam into position with the four self-locking eyehooks (5) directly over the four lift points (1) in the rocket motor cluster (9).

*u.* Remove the eyebolts (3) from the self-locking eyehooks.

**WARNING:** Check that the threads of the eyebolts and lift point holes (1) in the rocket motor cluster are in good condition.

**WARNING:** Insure that the flange of the eyebolt fits flush against the surface of the rocket motor. If the eyebolt does not fit flush, determine if it is caused by interference with the fairing wedge or excessive length of the threads on the eyebolt.

*v.* Install the eyebolts in the lift points.

**Note.** When the eyebolt will not fit flush against the surface of the rocket motor due to excessive thread length, install 5/8-in. id flat steel washers of sufficient thickness on the eyebolt. Do not install more washers than necessary to compensate for excessive thread length.

**Note.** When misalignment or interference with the eyebolt flange is encountered, preventing the proper insertion of the eyebolts, rework the top fairing wedge (3, fig. 8-14) as prescribed in *w* and *x* below.

**WARNING:** Remove the top fairing wedge from the rocket motor cluster, and take it to a properly distant work area before performing the procedures in *w* (1) and (2) and *x* (1) below.

*w.* When lateral misalignment exists, perform (1) through (3) below.

**CAUTION:** Do not file into the magnesium framework supporting the fairing wedge skin.

**CAUTION:** Do not remove more than three thirty-seconds of an inch of material from the fairing wedge skin.

(1) Using a rattail file, rework both cutouts by filing the fairing wedge skin sufficiently to obtain a fit within the dimensions shown in view A, of figure 8-19.

(2) Touch up the reworked area with zinc-chromate primer coating 8010-161-7339 and white lusterless enamel 8010-297-2111 or olive drab lusterless enamel 8010-297-2116, as applicable.

(3) Install the fairing wedge.

*x.* When the longitudinal misalignment exists, perform (1) and (2) below.

(1) Perform the operation in *w* (1) above to obtain a fit within the dimensions shown in view B of figure 8-19, and touch up the fairing wedge as prescribed in *w* (2) above.

(2) Install the fairing wedge.

*y.* Attach the self-locking eyehooks to the eyebolts.

*z.* Raise the hoist beam slightly to apply tension to the lift chains (4, fig. 9-3).

**Note.** Both track assemblies (23) must be on the forward end of the rocket motor cluster truck (22) before placing the rocket motor cluster (9) on the truck.

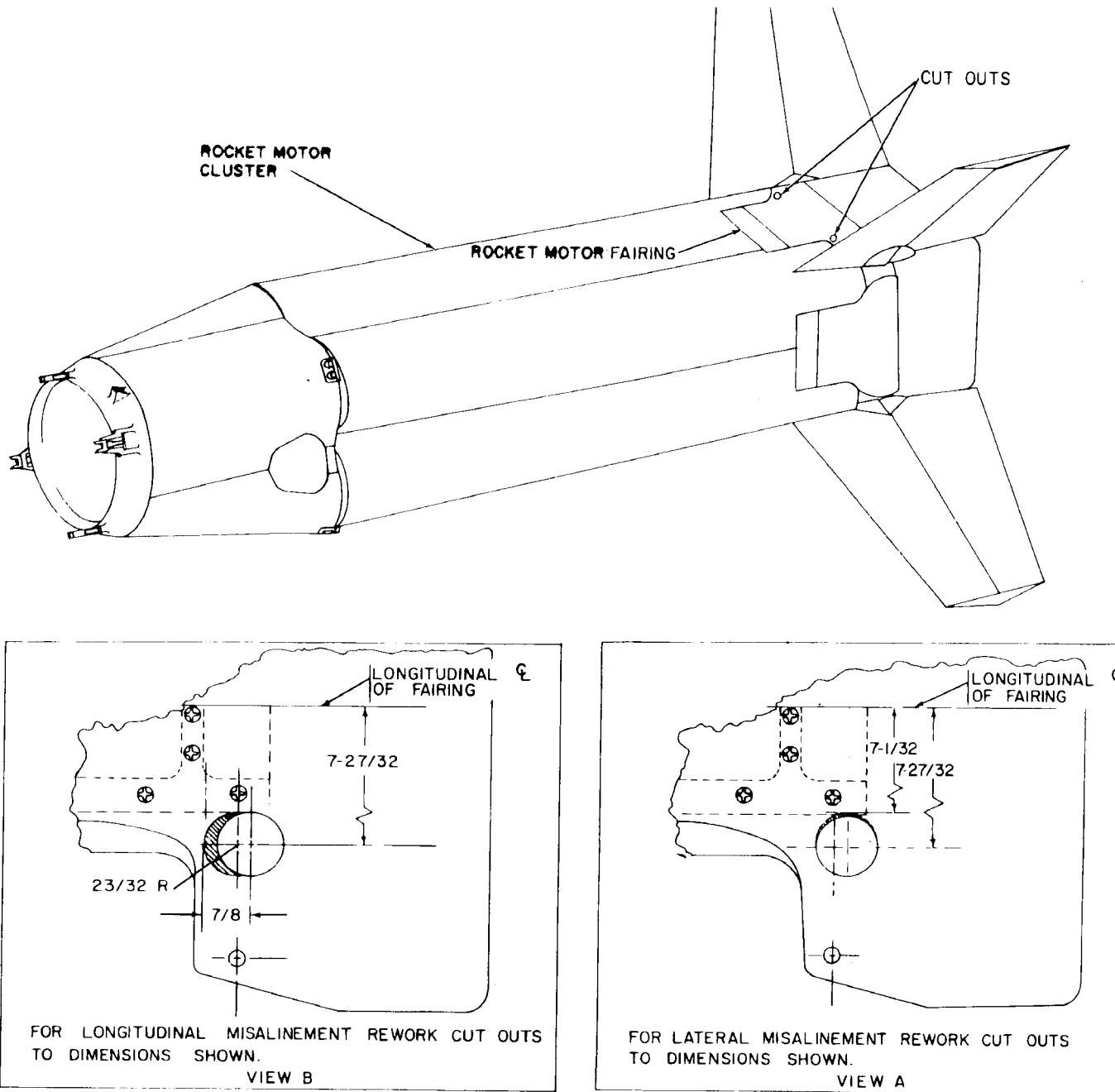
**Note.** Back off the adjusting bolt (18) and locknut (19) to insure that the slippers (13 and 20) will clear them.

*aa.* Lift the rocket motor cluster (5, fig. 8-18) clear of the base.

*ab.* Tighten the hexagon-head bolt (3, fig. 8-7) in each forward slipper assembly (1) to the torque value given in table 15-10.

ac. Position the rocket motor cluster on the rocket motor cluster truck; make certain

that the slippers seat properly into the supports (14 and 17, fig. 9-3) on the rocket motor cluster truck.



## NOTE:

1. ALL DIMENSIONS SHOWN ARE IN INCHES
2. TOLERANCE ON DIMENSIONS SHOWN IS  $\pm 1/32$

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Figure 8-19. Rework of the rocket motor cluster cutouts.

ad. Secure the cluster to the truck as prescribed below:

- (1) Install the two internal-wrenching or hexagon-head bolts (15) and recessed

washers (16) to secure the two forward retaining rail bars (21) to the two forward slipper assemblies.

- (2) Install the four hexagon-head

screws (12) and flat washers (11) to secure the two rear retaining rail bars (10) to the rear slippers.

- (3) Tighten the adjusting bolt and lock-nut at each support on the truck.

*ae.* Remove the hoist beam (7) from the cluster (9) as prescribed below.

- (1) Remove the self-locking eyehooks (5) from the eyebolts (3).
- (2) Remove the eyebolts from the lift points (1), and attach to the self-locking eyehooks.
- (3) Install the plugs (2) in the four lift points.
- (4) Remove the hoist beam from the cluster, and lift the hoist beam clear.

*Note.* When the top, bottom, and side fairing wedges are removed, the forward fairings must be supported.

*af.* Remove the two side fairing wedges (5, fig. 8-13) as prescribed below.

- (1) Remove the hexagon nuts (3), flat washers (2), and hexagon-head bolts (6).
- (2) Remove the hexagon-head bolts (7) and flat washers (8).
- (3) Remove the two side fairing wedges.

*ag.* Remove the top and bottom fairing wedges (3 and 8, fig. 8-14) as prescribed below.

- (1) Remove the hexagon nuts (1), flat washers (2), and hexagon-head bolts (11).
- (2) Remove the hexagon-head bolts (4) and flat washers (5) that secure the top fairing wedge; remove the fairing wedge.
- (3) Remove the hexagon-head bolts (10) and flat washers (9) that secure the bottom fairing wedge; remove the fairing wedge.

*ah.* Remove the four forward nozzle fairings (1, fig. 8-13).

*ai.* Remove the assembled nozzle fairings (5, fig. 8-12) as prescribed in (1) and (2) below:

- (1) Loosen the fillister-head screws (7, fig. 8-11) that secure the four nozzle fairings (1, 2, 6, and 9, fig. 8-11) together.

*Note.* Make certain that the filler blocks (1, fig. 8-12) are taped in place before completely removing the assembled nozzle fairings.

- (2) Slide the assembled nozzle fairings from the rear of the rocket motor cluster.

*aj.* Remove the four filler blocks by removing the tape holding each block in position.

*ak.* Tighten the following bolts to the torque value given in table 15-10.

- (1) The fitting assembly hexagon-head bolts (5, fig. 8-8; 2, fig. 8-10).
- (2) The fitting assembly internal-wrenching bolts (5, fig. 8-6; 5, fig. 8-10).
- (3) The rocket motor thrust ring assembly internal-wrenching bolts (2 and 8, fig. 8-9).

*al.* Install the four filler blocks, assembled nozzle fairing, four forward nozzle fairings, and four fairing wedges in accordance with para 8-6 *aj* through *au*.

*am.* Tighten the following bolts and screws to the torque value given in table 15-10.

- (1) Tighten all the nozzle fairing fillister-head screws (7, fig. 8-11) to 50 pound-inches prior to tightening them to the torque value given in table 15-10.
- (2) The nozzle fairing hexagon-head bolts (7, fig. 8-13 and 4, fig. 8-14).
- (3) The fitting assembly hexagon nuts (3, fig. 8-13 and 1, fig. 8-14).
- (4) The hexagon-head bolts (4, fig. 8-11).

*an.* Remove the rocket motor fins from the fin storage racks on the rocket motor truck.

*ao.* Position the two rocket motor cluster fin assemblies (fig. 8-15) on the upper sides of the rocket motor cluster. Secure with eight hexagon-head bolts and eight flat washers in each fin. Tighten all bolts to the torque values given in table 15-10.

*ap.* Perform the steps below to prepare the rocket motor cluster shipping and storage box for storage or shipment.

- (1) Position and secure the strap with the two hexagon-head screws and flat washers (fig. 8-17).
- (2) Install the forward and the rear clamp

assemblies (12 and 4, fig. 8-18) to the forward and rear cradle assemblies (13 and 14) respectively, and secure each clamp with the hexagon-head screws (6 and 3), internal-teeth lockwashers (7 and 2), and flat washers (8 and 1).

- (3) Tie the bag containing the screws and the washers removed in *m* and *o.1* above to the forward clamp.
- (4) (Deleted)
- (5) Secure the cover (fig. 8-16) to the base with the lag bolts and flat washers.
- (6) Turn the swivels securing the hasps of the cover and the two access doors.

*aq.* Inspect the rocket motor cluster for damage in the area where the clamp assemblies (4 and 12, fig. 8-18) and the cradle assemblies (13 and 14) were secured to the rocket motor cluster.

## 8-8. Rocket Motor Igniter Cable Assembly Test, using A Multimeter

*a.* Visually inspect the rocket motor igniter cable assembly (4, fig. 13-9) for external damage, cuts, dents, and pinched or broken insulation. Remove the shorting plug from P109A, and inspect the connector for the presence of corrosion or moisture and damaged, bent, or missing pins. Inspect P1, P2, P3, and P4 connectors for the presence of corrosion or moisture and damaged, bent, or missing pins.

*b.* This test is to be performed only on the following occasions:

- (1) Initially, or prior to installation of the cable assembly.
- (2) Semiannually, concurrent with the removal of the rocket motor igniters (para 12-101).
- (3) Whenever the cable assembly is removed for any other reason.

*c.* Perform the continuity test in accordance with table 8-1, using the R X 1 scale of the multimeter.

Table 8-1. Continuity Test of the Rocket Motor Igniter Cable Assembly

Positive test probe connected to:		Negative test probe connected to:		Normal indication
Connector	Pin	Connector	Pin	
P109A	A	P1 through P4	1	9 to 11
P109A	A	P1	Shell	Open circuit (infinity)
P109A	B	P1 through P4	2	Continuity (less than 1 ohm)
P109A	B	P1	Shell	Open circuit (infinity)
P109A	A	P109A	C	Continuity (less than 1 ohm)
P109A	A	P109A	E	Continuity (less than 1 ohm)
P109A	A	P109A	G	Continuity (less than 1 ohm)
P109A	A	P109A	B	Open circuit (infinity)
P109A	A	P109A	J	Open circuit (infinity)
P109A	A	P109A	Shell	Open circuit (infinity)
P109A	B	P109A	D	Continuity (less than 1 ohm)
P109A	B	P109A	F	Continuity (less than 1 ohm)
P109A	B	P109A	H	Continuity (less than 1 ohm)
P109A	B	P109A	J	Open circuit (infinity)
P109A	B	P109A	Shell	Open circuit (infinity)
P109A	K	P109A	J	Continuity (less than 1 ohm)
P1 <sup>1</sup>	1	P2 <sup>1</sup>	2	9 to 11 ohms

<sup>1</sup> Replace the shorting connector on P109A while performing this test.

## 8-9. Installation of the Rocket Motor Igniter Cable Assembly

*Note.* If the rocket motor igniter cable assembly is installed, verify that it is installed in accordance with the following procedures:

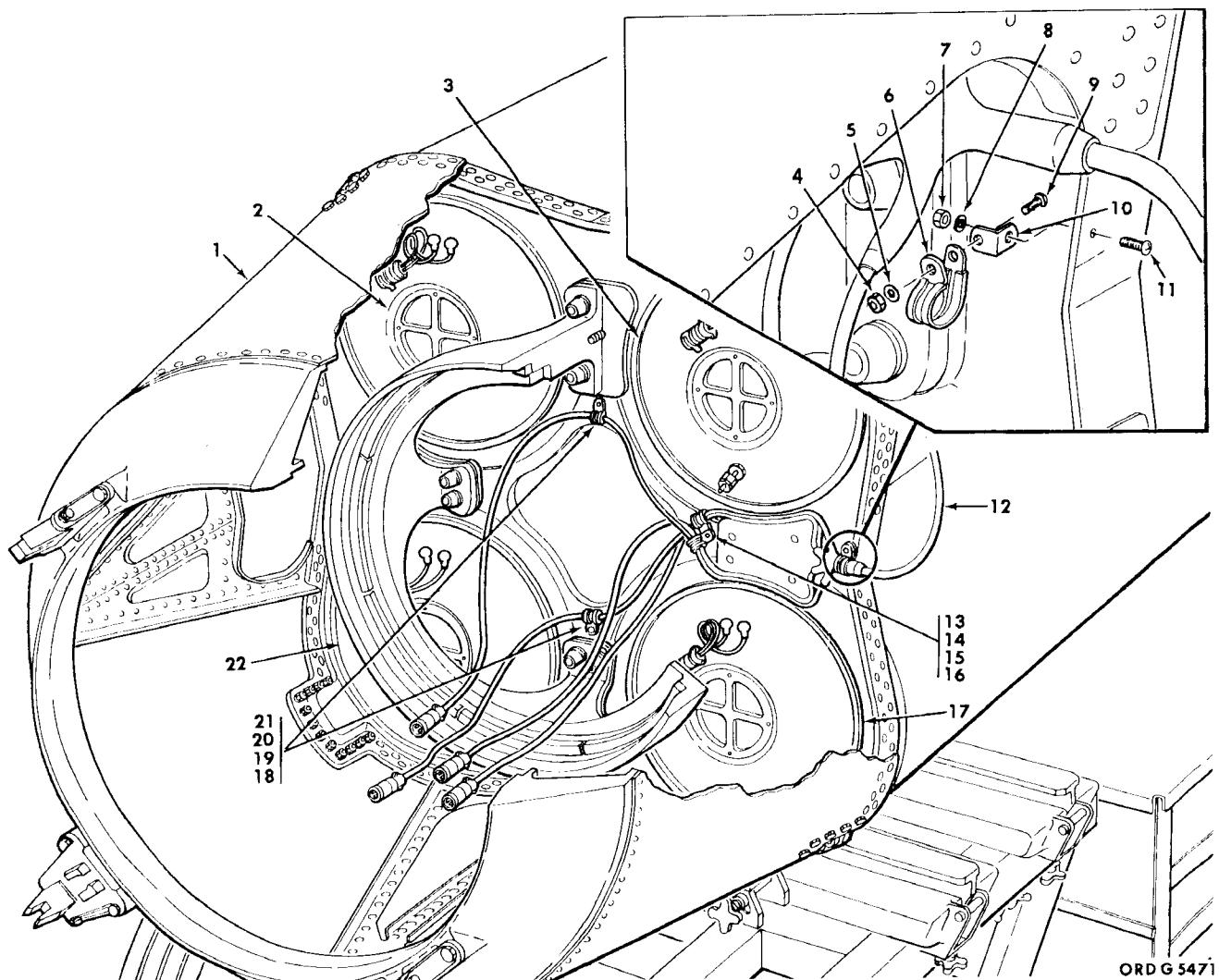
*a.* Check that the shorting connector (fig. 10-9) is installed on connector P109A of the rocket motor igniters cable assembly (12, fig. 8-20).

*b.* Position the bracket (10) on the rocket

motor thrust ring assembly (1), and secure in position with the truss-head screw (11), flat washer (8), and hexagon nut (7).

c. Assemble the clamp (6) to the cable

assembly, and secure to the bracket with the truss-head screw (9), flat washer (5), and hexagon nut (4).



1—Rocket motor thrust ring assy  
 2—Rocket motor 2  
 3—Rocket motor 1  
 4—No. 10-32 hex nut  
 5—No. 10 fl washer  
 6—Clamp MS21919DG15  
 7—No. 10-32 hex. nut  
 8—No. 10 fl washer  
 ■ 9—No. 10-32 X 5/8 truss-hd screw  
 10—Bracket  
 ■ 11—No. 10-32 X 3/4 truss-hd screw  
 12—Rocket motor igniter cable assy  
 13—Clamp MS21919WDG9 (2)  
 14—No. 10-32 X 1-1/4 truss-hd screw  
 15—No. 10 fl washer  
 16—No. 10-32 hex. washer  
 17—Rocket motor 4  
 18—No. 10-32 hex. nut  
 19—No. 10 fl washer  
 20—No. 10-32 X 1-1/4 truss-hd screw  
 21—Clamp MS21919WDG5  
 22—Rocket motor 3

*Figure 8-20. Removal and installation of the rocket motor igniter cable assembly.*

*d.* Assemble the two clamps (13) to the cable assembly, and secure the clamps to the thrust ring assembly with the truss-head screw (14), flat washer (15), and hexagon nut (16).

*e.* Assemble the clamp (21) to the cable containing connector P1, and secure the clamp to the lower position on the thrust ring assembly with the truss-head screw (20), flat washer (19), and hexagon nut (18).

*f.* Assemble the clamp (21) to the remaining cable, and secure the clamp to the upper

position on the thrust ring assembly with the truss-head screw, flat washer, and hexagon nut.

*g.* Place the rocket motor igniter cable assembly connectors P1, P2, P3, and P4 with the excess cable between the thrust structure pedestal and the base to assure that the connectors are not damaged in subsequent operations.

*h.* Roll up the loose end of the rocket motor igniter cable assembly, and securely tape or tie the roll in place on top of the thrust structure.

*i.* Remove ground strap.